NICKEL ELECTROLESS PLATING ON METAL SUBSTRATES

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1 PURPOSE

To provide corrosion protection for metallic products.

2 DESCRIPTION

This coating consists of an electroless nickel plate, with a phosphorous content of 6 - 10%, per the requirements of ASTM-B733, Type I, unless otherwise specified in this specification or on the part drawing.

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APPROVAL:

Art Clockedile, Systems Materials Engineering

3 PHYSICAL REQUIREMENTS

a. Film Thickness: .0004 to .0006 inch.

Acceptable Film Thickness Test Methods:

Beta BackScatter	ASTM-B567
Coulometric	ASTM-B504
Microscopical	ASTM-B487

In the event of conflicting results, the microscopical method shall take precedence.

b. Surface Resistivity:

The surface resistivity, per *DEC STD 092-3 Finish and Color Standard - Finish Material Test Requirements*, shall be 0.1 ohm per square or less, unless otherwise specified.

4 QUALITY OF PLATING

a. Thickness:

Unless indicated on the drawing, the thicknesses shall be controlled as specified.

Coverage and continuity must be ensured by visual inspection.

b. Adhesion Requirements:

Any or all of the following tests may be used to test adhesion to the base material.

1. Tape Test Method:

   Scotch Brand #600, 1-inch wide, tape shall be applied on the surface with uniform pressure. Within 90 ± 30 seconds of application, the tape shall be removed in a quick motion at 90 degrees to the surface. For acceptance, the finish shall remain unbroken after the tape is removed.

2. Bend Test: (ASTM B-571)

   Evidence of poor adhesion, peeling or flaking of the coating from the substrate are causes for rejection. Cracking is acceptable in the bend area, unless the plating peels away from the substrate.

3. Scribe Test:

   Scrape the surface of the plated articles to expose the base material. Examine the sample at four times magnification to determine if removal has been caused by the cutting away of an adherent plate or by the lifting of a non-adherent plate.

4. Burnishing Test: (ASTM B-571)

   After the sample is rubbed for 15 seconds, the test area shall not have any blisters. Lifting or peeling of the plating is not acceptable.

5. Thermal Shock Test: (ASTM B-733)

Signs of blistering, lifting, or peeling are cause for rejection.

c. Environmental Exposure:

Salt Spray:

ASTM B-117 shall be used to determine salt spray resistance, using a 5 percent salt concentration. Panels shall be suspended vertically in the chamber for a duration of 96 hours.

After the environmental tests there shall be no evidence of gross film failure, such as flaking or loss of adhesion. The exposed articles shall be assigned a rating according to ASTM-B537-70, Figure A2 - Example of Corrosion Appearance. A protection rating of 7 or better shall be considered acceptable. Also, after the tests, the coating shall pass the adhesion requirements.

5 APPEARANCE QUALITY

Unless otherwise specified, this finish shall meet a quality level of 5, per *DEC STD 092-1 Finish and Color Standard - Finish Standard for Applications*.

The finish shall have uniform appearance and color, be semi-bright continuous, smooth, fine-grained, adherent; and free from blisters, pits, scratches, foreign contamination, drip marks, and any other defects which may affect the functional properties of this coating.

Slight discoloration caused by the process is allowed, unless it conflicts with any other requirement within this document.

Racking marks smaller than 1/8-inch in diameter are acceptable.

Scratches and tool marks that are covered by the plating are allowable.

SUBSTRATE APPEARANCE: The general appearance and quality of the plating is dictated by the surface to which it is applied. No mechanical preparations will be done to eliminate flaws, scratches, operation marks, and other defects.

6 PACKAGING/HANDLING/STORAGE

Before, during, and after plating, the parts shall not be subjected to any hostile environments that may affect the appearance or function of the coating. The plated parts shall also be packaged to protect the parts and their finish during normal handling operations, transportation, and storage.

7 GENERAL REQUIREMENTS

To improve corrosion resistance the electroless nickel plate could receive a chromate passivation treatment. This passivation treatment is required on porous iron-based castings.

It is recommended to follow the procedures in ASTM-B-733 for hydrogen embrittlement relief.

The hardness of the nickel as plated is about 47 Rockwell C, and can be heat treated to about 67 Rockwell C. If the plate is to be heat treated, the baking schedule shall be indicated on the part drawing. It should be noted that heat treatment has a detrimental impact on the corrosion resistance of the nickel.

When it is not practical to subject the parts to the tests specified, and the responsible Digital engineer agrees, the Environmental Exposure and Bend Test may be made by the use of separate specimens plated concurrently with the articles represented. The separate specimens shall be of a basis metal equivalent to that of the articles represented.

Use of this finish is a function of the implementation. Surfaces to which it is applied, the complexity of the part, and the use of this finish must be proven by actual product testing and evaluation.

Regardless of appearance at any viewing distance no defect is allowed that will affect the functional properties of the finish or the part. Suspect conditions shall be resolved by the responsible engineering group.

Aluminum alloys shall be heat treated to improve adhesion. Other base alloys may be heat treated to improve adhesion, refer to ASTM B733 for the heat treatment schedules.